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ABSTRACT

The effect of using multiple-choice questions as review aids was investigated in four groups of college students. One group generated multiple-choice questions and used them as review aids, while the second group (the "yoked" group) used the questions generated by the first group. The third group used the experimenter's questions, and the fourth group did not use any structure strategy. The results showed that the "yoked" group performed best on a general retention test and also on an incidental learning test. The group which received the experimenter's questions performed best in the intentional learning test. The result contrasted with the findings of some earlier studies which used essay-type questions as study aids. (Author/AA)

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USING MULTIPLE - CHOICE QUESTIONS AS REVIEW AIDS IN PROSE LEARNING

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USING MULTIPLE - CHOICE QUESTIONS AS REVIEW AIDS IN PROSE LEARNING

ABSTRACT

The effect of using Multiple-choice questions in [redacted] study strategies as review aids was investigated. One group generated multiple-choice questions and used them as review aids, while the second group, the 'yoked' group, was given the questions generated by the first group as study aids. The third group used the experimenter's questions and the fourth group did not use any structured strategy. The results showed that the 'Yoked' group performed best on the general retention test and also on the incidental learning test. The group which received the experimenter's questions performed best in the intentional learning test. The result contrasted the findings of some earlier studies which used essay type questions as study aids.

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Using Multiple-Choice Questions As Review Aids in Prose Learning

In recent years, many different types of studies have been carried out in an attempt to understand processes which facilitate the learning and retention of prose material. In a review of such studies, Carver (1972) enumerted the important variables identified to date. The most important in predicting retention are: (a) the difficulty of the material; (b) the ability of the individual; (c) the time that the individual spends in the learning process; and (d) the strategy that the individual executes during the learning situation. Most of these studies, however, (Boyd 1968; Bruning 1968; Frase 1967, 1968a, 1968b, 1968c; ~~Patrick 1968~~; Rothkpf ~~1965~~, 1966; Rothkopf and Bisbicos 1967;) concentrated largely on an area specifically related to the effects of questions upon the retention of prose material.

A series of such studies involve interspersing so-called experimental questions with prose passage. One or more of these questions is placed before (QB) or after (QA) one or more paragraph containing information that answers them. After the subjects finish reading the passage, they are immediately given a posttest containing questions identical to the question in the passage (intentional items) plus a number of questions not among the experimental questions (incidental items). The performance of subjects who received questions in the passage is then usually compared with that of control subjects who did not. The purpose of the intentional and incidental questions is to, test the specific and general effects of the interspersed questions.

The following generalizations may be made from some of such studies. (a) Performance of the experimental subjects on intentional items in the posttest is greater than on incidental items in both QB and QA conditions. This is a specific effect of experimental questions. (b) Subjects in the QA condition out perform control subjects on intentional items in most of the studies where the time spent during the learning process is not controlled.

Recent studies have usually controlled for the effect of material difficulty upon retention by using one reading passage, i.e., one level of difficulty. The ability of the individual as a variable, in such prose learning studies has been partially controlled by using a certain level of ability, such as high secondary school or college students, and by attempting to match groups or use an individual as his own control.

In most of the studies on prose learning, concentration has been on the effects of adjunct questions on the retention of textual material. The importance of the strategy used by the learner was amplified by Carver and Darby (1971). In their study of reading they found that variations in the strategy used by Subjects on a standardized reading test were correlated significantly with performance on the test. But in prose learning, recent research has failed to adequately control for the effect of different strategies. In most studies the subjects are not informed about how to regard the treatment questions. Carver noted that "... if there are theoretical inferences to be tested concerning how individuals learn

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the answers to specific questions while reading prose material, then it would seem to be a poor research strategy to complicate the testing of these hypotheses by not informing S that this was the purpose so that he could adopt an appropriate program (strategy)".

In an earlier article (Adejumo, 1973) the strategy to be used by the subjects was indicated in the instruction. This allowed for the testing of specific effects of the strategies used by the subjects. In that study, the effects of two strategies were tested, i.e. the effects of (a) the use of adjunct questions supplied by the teacher (experimenter questions), (b) the use of subjects-self-generated questions and their use as adjunct aids. There was the control group with a general instruction to use any strategy. The essay type of questions was used as adjunct questions. The subjects in the self-generated group were also directed to construct essay type of questions and used them as instructional guide or adjunct aids.

The purpose of this study was to compare the relative efficiency of the study strategies involving the use of adjunct questions in learning prose material. In particular, the study was to investigate the use of "multiple-choice" questions as adjunct aids. Three of these strategies were structured and the fourth was unstructured. The following was a description of the four strategies. (a) In the subject-generated question strategy the subjects were instructed to construct multiple-choice questions on the passage which they can answer. These questions were to serve as aids to them in reorganizing the text and in bringing out the salient points from the passage in question form.

(b) The Experimenter-adjunct question strategy consisted of multiple questions accompanying the prose passage. The questions were meant to aid in the comprehension of the passage. (c) The "Yoked-subject-generated-adjunct questions " was used as a strategy. The subjects received questions constructed by the first group and use these questions as aids in comprehending the passage.

(d) The Unstructured strategy group served as the 'control' and had the same passage but did not employ any structured treatment condition.

Based on the findings reported above and the suggestion that the degree of acquisition of information by the subjects depends largely on the activities engaged in with the prose material, the following predictions are made with regard to the expected outcome of the study.

(1) There will be significant differences between each of the structured treatment conditions and the unstructured 'control' group.

(2) There will be significant differences among the structured treatment conditions in the general retention test.

(3) The Subject-generated question group will perform significantly better than each of the two other structured groups in the treatment conditions.

(4) There will be no significant difference between the Experimenter-adjunct question group and the Yoked-subject-generated-adjunct question group.

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METHODOLOGY

Subjects and Material:

1. The subjects for the study were sixty-eight college students enrolled in an introductory Psychology course. They were randomly assigned into four groups. Each of the groups was also randomly assigned to treatments. The prose material used for the first preliminary test was culled from Browley's book "The Psychology of Human Aging, Retirement and Disengagement". The 1000 word-passage was factual and instructive. The second material used in the main experiment was an excerpt from Chaplin and Kraviec's books, Systems and Theories of Psychology. The passage was highly factual and instructive one dealing with views of Titchener on "affection" and "emotion" as seen by a structuralist psychologist. The passage contained approximately 1,800 words. The article was typed on ditto with single spacing. The instructions on the passage for each different group were typed double spaced on a separate cover page. The important directions in the instructions were underlined so as to bring the attention of the subjects to them.

2. General Retention Test Questions: 40 multipe-choice items were from the passage for the general retention test. These questions were typed (double spaced) on 8 pages and then bound into a booklet. Each of the stems in the test items had four suggested responses from which the subject was to choose the one that best answered the question or completed the blank space in the stem. True-false answers were omitted in order to reduce the probability of guessing the right answer.

3. Adjunct questions: The questions used as adjunct aids for the Experimenter-adjunct question group were 10 questions selected from the

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40 questions in the general retention test. These questions were not randomly selected. The questions were selected so that there were, at least, two questions per page on the passage, and they covered the information in about two adjacent paragraphs.

4. 'Yoked group questions:' The 'yoked' questions were the multiple-choice questions constructed by the subjects in the self-generated question groups.

PROCEDURE

Treatment and Instructions: There were four groups in the study. Each of the four groups received different instructions. The study relied heavily on the proper understanding and following of the instructions by the subjects. These instructions were regarded as a major part of the study. The subjects attention was specifically directed to the instructions that were typed on the cover page of the booklet.

The four treatment groups are:-

(a) The Self-generated question group was to read the article and write our ten multiple-choice questions. These questions were to be answered and used as adjunct aids by the subjects who wrote them.

(b) The second group was the "Yoked" group which received the questions generated by their matched colleagues in the Self-generated question group. The questions were given to the subjects in the same form as they were written by their matched colleagues. The subjects in this group were to answer the questions in the booklet provided and also use the questions as study aids.

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(c) The third treatment group was the Experimenter-adjunct question group which received 10 questions which were part of the general retention test questions. These questions were to be used as aids in studying the passage. Subjects were also to answer the 10 questions during the study period.

(d) The unstructured group received the same passage and was told to use any strategy that they thought would aid them in acquiring information from the passage.

All the subjects were first tested in a general comprehension exercise a week before the main experiment. The material used for this exercise was an excerpt from D.B. Brewley's book, "The Psychology of Human Aging, Retirment and Disengagement". The passage is factual and instructive. The direction was given to all the groups which was that they should read it carefully. A post-test was given immediately. The post-test was composed of fifteen multiple-choice item.

The main experiment came up a week later and the subjects were tested in groups in four large classrooms. The design of the study allowed for testing the "yoked" group only after the self-generated group had finished their first part of the experiment, i.e. reading the article and writing out the ten multiple-choice questions. As a result of this, three groups, (the SGQ, the control and the EQ) started first. After the expiration of the running time for the first part, SQ groups' questions were included in the package for the subjects in the "Yoked" group. Each group was given the general retention test after the first part had been completed.

The actual testing period for any of the groups took a total of one hour and twenty minutes. Fifty minutes were allowed for the study of the passage and the required activity. The second phase, which was the taking of the general retention test, took thirty minutes. The running time was adequately controlled because this had been lacking in other experiments.

Scoring: The subjects recorded their responses for the general retention test on the answer sheet provided. The SQ, 'Yoked' and the EQ groups recorded the 'correct' responses to the questions used as adjunct aids on separate answer sheets. Each correct response in the general retention test, and also in the EQ groups' questions was scored one point.

RESULTS

The data collected for the four groups in preliminary comprehension test were first analysed. There was no significant differences among the means of the four groups. ($F=1.06$, $3/64$ $P>.05$). It was on the basis of this that the main experiment was carried out. Another basic analysis was performed on the general retention test questions. A Kuder-Richardson formula 20 was performed on the 40 multiple-choice items given to each of the groups. The result showed the groups had the following as the reliability coefficient and the standard error of measurement respectively; SQ, .79, 2.50; Yoked, .85, 2.06; Exp. Q, .73, 2.37; and Control, .83, 2.18. The test was thus deemed appropriate and could differentiate among the subjects. General Retention Test: Four specific hypotheses were made and all of them were based on the predicted results of the general retention test. The mean and standard

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deviation for the Self-generated question group were 28.29 and 5.50 respectively; for the Yoked group, 33.41 and 5.30; for the Experimenter-adjunct question group, 31.35 and 4.52; and the Unstructured group, 31.88 and 5.22 respectively.

Analysis of variance was performed on the scores on the general retention test for all the four groups. There was significant effect due to the treatments; F= 2.78, df = 3/64, P. $<$ .05. Since a significant treatment effect was found further analyses were performed on the test.

Table Ia and b about here

Newman-Keuls tests were used to test the differences in the treatment means. The finding revealed that no group was significantly different from the unstructured 'control' group. The 'Yoked' group had the highest mean score of 33.41. Hypothesis 1 which predicted that there would be significant differences between each of the structured treatment conditions and the unstructured 'control' group was not accepted on the basis of the results.

Hypothesis 2 predicted that there would be significant differences among the treatment structured conditions in the general retention test. Newman-Keuls tests were also performed on the means of the structured groups. The results showed that between the SGQ and the Yoked group, q = 5.12 p $<$ .05; between SGQ and Experimenter-adjunct group, q = 3.06, p $>$ 05; between the Experimenter-adjunct and the Yoked group, q 2.06, p $>$ .05. The hypothesis was thus supported. The Yoked group was significantly different from the SGQ but no other groups were significantly different.

Hypothesis 3 predicted that the Self-generated question group would perform significantly better than each of the two structured groups in the treatment conditions. Comparisons of the three means using the Newman-Keuls test resulted in a significant difference between the 'Yoked' and the SGQ but no significant difference between the SGQ and the Experimenter-adjunct groups. In fact the SGQ group had the lowest mean score ($\bar{X}$=28.29) of all the three structured groups. The hypothesis was not supported. The result showed that the treatment condition - the SGQ - might have had a negative effect on the performance of the subjects on the general retention test.

The fourth hypothesis predicted that there would be no significant difference between the Experimenter-adjunct question group and the 'Yoked' group. The result showed that there was no significant difference between the two groups. The hypothesis was therefore supported. A summary of the comparisons of the means, using Newman-Keul tests is presented in Table IB

Performance of Incidental Tasti Further analyses were carried out on the scores of the subjects in the test. Since the Experimenter-adjunct questions group received 10 questions which were part of the 40 questions in the general retention test, the scores of the four groups without the 10 questions included in the Experimenter-adjunct questions group were analyzed. This was because the Experimenter-adjunct questions group had an initial advantage over the other groups of having 10 items from the posttest during the study period. Performance in the 30 items was regarded as being an equated performance based on incidental information acquired from the passage. The 'Yoked' group had the highest mean, 25.06, with a standard deviation of 3.98.

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This was followed by the Unstructured group, $\bar{X}$ = 23.88 and SD -5.24. The Experimenter-adjunct group had a mean of 22.71 and a SD of 3.61. The group which performed poorest was the SGQ group with a mean of 21.35 and a SD of 3.79. An analysis of variance performed on the data showed no significant main effect: This indicated that there is no significant difference among the groups in their performance on the 30 questions which composed the 'Incidential' test.

Table II about here

Table II shows a summary of the analysis of variance performed on the 'incidental' scores. A closer inspection of the data suggests that the 'Yoked' group, then the 'Control' group performed highest in the general retention test. This presents striking finding as one would have expected the Experimenter-adjunct questions group to perform best, if not the SGQ, in the General Retention test as the former group had an initial advantage over the other groups of having 10 questions from the posttest during the study./ Performance on Intentional Learning: As a corollary to the finding above, all the scores of the four groups on the 10 questions received by the Experimenter-adjunct question group were further analyzed. The group that had the highest mean was the Experimenter-adjunct group: $\bar{X}$ = 8.31, SD = 1.31. The group which scored lowest was the SGQ: $\bar{X}$ = 6.94, SD = 2.07. As expected the Experimenter-adjunct group learned from the question provided to them as aids during the study period.

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An analysis of variance was performed on these data to determine whether the superior performance of the Experimenter-adjunct question group was significant. The results yielded an $F = 3.55$, $df = 3.64$, $p < .05$ which indicated a significant treatment effect. With the significant main effect, further analysis was made to determine the differences among the group. Newman-Keuls tests were used to test the differences. Singnificant differences were found between the 'Yoked' group and the SGQ group ($q = 1.40$, $p < .05$); also between the Experimenter-adjunct question group and the SGQ ($q = 1.76$, $p < .05$). Other comparisons made among the groups yielded no significant differences. See Table III

Table IIIa and b about here

A striking finding was the nonsignificant difference found between the 'Yoked' group and the Experimenter-adjunct question group, $q = .3$, $p > .05$; and also between the 'Yoked' group and the 'Control' $q = .3$, $p > .05$.

D I S C U S S I O N

The purpose of this tudy was to investigate the effects of some strategies on the retention and recall of prose material. A clear indication of using strategies has not been made in most of the studies in this area. Instead of learning answers to questions and transferring the knowledge to the test situation, questions were used as study strategies for the facilitation of information acquisition. The results of the study revealed that subjects who used questions written by their colleagues as study strategies found that the questions were facilitative in the acquisition and retention of

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the prose material. The 'Yoked' group performed highest among the groups. It was also found that the unstructured group, i.e., the group that was allowed to use any study strategy performed next highest among the groups. The group which received the experimenters questions and was told to use the questions as study aids, performed below the two groups above. The group which performed poorest was the group which was told to generate its own questions, write out the questions, and use the questionsas a study strategy. These results were found to be surprising.

The general finding in the earlier studies using questions as adjunct aids was the positive facilitation of the experimenter questions in the information processing. Generally, the groups which received questions performed significantly better than the 'control' group. Rothkopf (1966), Frase (1967, 1968a, b, c) and Boyd (1973) have found results showing superior performance of groups which receive adjunct questions over the 'control' group which receives no adjunct questions. The common controversy in the earlier studies was on the position of the questions in the passage.

A number of reasons can be adduced for this finding. In the first place, the control of the inspection time needs to be examined. In most of the earlier studies inspection time was not fixed. Each subject was allowed to spend as much time as he felt necessary on the passage. In this study, the time is fixed and all groups, regardless of what type of strategy was to be used, were allowed the same amount of inspection time. Carver (1972) brought up the problem of inspection time in his review of studies on prose material. He argued that the superior performance of the group which received the experimenter's questions over the 'control' group

may be due to more inspection time being devoted to the material in this group than in the control group. In fact, the average inspection time recorded by those who received the adjunct-aid questions was significantly higher than the inspection time in the control group. With fixed inspection time in this study, the result revealed that the 'control' group scored higher than those groups which received the experimenter's questions although it did not reach a significant level. One plausible reason for this would be that the subjects in the control group had more time to read over the passage as may times as possible, within the fixed time period. This was not possible in the earlier studies as referral back was not allowed. Reading over the passage might have been a form of rehearsal or review for the subjects in the control group who would have been able to acwuire as much information from the passage as compared with those who received adjunct questions. The SGQ group was predicted to perform significantly better than the 'Yoked' group because the writing out of questions on the passage, and using the questions as study strategies, was regarded as an activity "which involves a comprehensive analysis of the textual material which includes reading, studying, attending to, and asking oneself questions which conceptualize the salient points in the passage" (watts and Anderson 1971). It was also believed that this activity would force the subjects to go beyond the literal content of instructions and demand more than verbatim memorization and recall of the material. The finding of poor performance in the SGQ group is surprising.

This finding contrasted with the findings in some earlier studies on prose

Learning. In earlier experiments the SGQ group performed significantly better than any other group. It should, however, be pointed out that there was a difference in the type of question contructed by the SGQ group and used as adjunct aid. While the SGQ group in this experiment constructed "Multiple-choice" questions, the SGQ group in the earlier experiments constructed the "essay" type of questions. It is usually agreed that the essay questions are much easier to construct than the multiple choice questions. It is possible that the subjects in this group spent more time in the construction of the questions than in using the questions as a strategy. It seems that writing questions of a multiple-choice form requires special skills. It is doubtful whether the subjects had had any training in writing questions of this form. In that case it is reasonable to expect that the thought of constructing questions on the passage migh have nagative effects on the acquisition of the information in the passage and also in the use of the questions as a strategy. It was noted in the experiment that subjects in the SGQ group spent the whole period working on the passage. It seems that valuable time for studying the material was taken up by the construction of the multipe-choice questions. It is possible that if the time had not been fixed, there would be the likelihood that the subjects would be able to overcome their initial difficulties in constructing questions and use the questions as a study strategy.

The Yoked group did perform significantly better than the SGQ group. The reason for this can be deduced from what some of the subjects in the group said after the experiment. The subjects confirmed that the questions constructed by the SGQ group were facilitating and that questions were all

factual and within their conceptual level. They were able to use the questions as study aids instead of spending a large part of the time looking for the answers to the questions. This finding raises a questions which needs to be investigated. Most questions for review or as adjunct-aids are usually drawn by the experimenter or the author of the textual material. The problem is whether these questions are in fact having the positive effect they are supposed to have or are a hindrance to the acquisition of information in the textual material. It seems that subjects may benefit more from the questions constructed by their colleagues on the textual material. A rationale for this could be based on the assumption that study strategies are usually developed with age. There is the possibility that the level of development of learning strategies is relatively the same within the same age group and educational level. If this is the case, the subjects within a certain level of education or ability or age may be able to communicate better with their colleagues than other subjects from different groups. It would be reasonable therefore to regard superior performance of the 'Yoked' group over the SGQ group as being a function of the adequate difficulty level or 'arousal level' of the questions from the SGQ group.

The results of the analysis on the incidental scores in this study revealed no significant differences among the groups. This result supports the finding or Natkin and Stahler (1969) in which there was no significant difference between those who received questions and those who did not on the immediate test although these was a difference in the delayed test. It is also noteworthy that Boyd (1973) found similar results in the analysis of the data on the test

for incidental information. When Hopkin and Chadbourn's (1967) reanalysed Rothkopf's data no significant difference was found among the treatment groups on the incidental information. This is contrary to what was found by Rothkopf. The recent findings have favored the lack of significant differences among the treatment groups and the control groups on incidental tests. These findings even came from experiments where the subjects were not allowed to refer back to the pages and the inspection time was not fixed for all the groups. It is not too surprising to find similar results in this study where the inspection time was 'controlled'.

The finding on the test for intentional learning is consistent with previous findings in prose learning. Boyd (1973), found that the groups which received the experimenter's review questions performed best among the treatment groups in the analysis of the data on the intentional learning. This result is expected because the subjects in the experimenter-adjunct question group had had a preexposure to the questions, wrote answers to the questions and also reviewed the passage with the questions. The superior performance of this group in the test that followed the study period on intentional learning, indicated that the subjects in the group learned from the questions. The learned responses to the items were facilitative in the test for intentional learning.

In summary, the present study served to highlight some problems which might be inherent in the use of strategies in prose learning. The use of questions seems to be facilitating in information acquisition for textual material but difficulty level of the questions, the skill in writing and using multiple-choice questions as review aids, and also interaction with the complexity of the material, need to be further investigated.

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T A B L E 1a

Summary of the Analysis of Variance

Performed on General Retention Scores

Source	SS	df	Ms	F
Treatment	234.93	3	78.31	2.78*
Within	1803.33	64	28.18	
T O T A L	2038.26	67		

* = p. $<$ .05

T A B L E 1b

Differences among the Means

Groups	1	2	3	4
1	-	5.12*	3.06	3.59
2		-	2.06	1.53
3			-	.06
4				-

* = p $<$ .05

Newman-Keuls test)

TABLE II

Summary of the Analysis of Variance Performed on the Incidental Scores

Source	SS	DF	MS	F
Treatment	129.77	3	43.26	2.56^{NS}
Within	1082.50	64	16.91	
TOTAL	1213.26	67		

TABLE IIIa

Summary of the Analysis of Variance
Performed on the Intentional Scores

Source	SS	Df	Ms	F
Treatment	29.65	3	9.88	3.55*
Within	178.37	64	2.79	
TOTAL	208.01	67		

*-p<.05

TABLE IIIb

Comparisons of the Means of the Four Groups
on Intentional Scores

Means: Group 1 - 6.94
Group 2 - 8.34
Group 3 - 8.71
Group 4 - 8.00

Differences among the Means

Groups	1	2	3	4
1	-	1.40*	1.76*	1.06
2		-	.37	.34
3			-	.71
4				-

(Newman-Keuls test) * = p<.05